Tonal preservation verse prosodic transfer in L3-Mandarin question intonation

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Abstract

This study examines prosodic transfer in L3-Mandarin among Cantonese-L1 speakers, investigating how pitch height and boundary timing signal interrogativity. Cantonese typically marks questions with a salient final-syllable F0 rise, whereas Mandarin employs overall pitch elevation while preserving final lexical tones. Twenty Cantonese-English-Mandarin trilinguals produced statements and questions in a reading conversation; their Mandarin proficiency was rated by native speakers. Results show asymmetric transfer: L1 boundary tone timing persisted in certain question types, yet the Mandarin-specific fall-rise tonal contour was maintained. Higher proficiency facilitated Mandarin-like pitch height modulation. The findings illustrate a duality in L3 acquisition, where prosodic transfer from the L1 coexists with target-like tonal production, highlighting how tonal typology constrains bilingual intonation.

Keywords: prosodic transfer, L3 acquisition, Mandarin, Cantonese, boundary tone

Introduction

Hong Kong's "Biliteracy and Trilingualism" policy fosters a population of Cantonese-English-Mandarin trilinguals. This provides a critical context for investigating cross-linguistic influence, particularly in prosody, between the two tonal languages of Cantonese and Mandarin. Crucially, they employ distinct strategies to signal interrogativity. Cantonese utilizes a boundary tone, which is realized as a salient final-syllable F0 rise that overrides lexical tones (Chen, 2020; Ge & Li, 2019). When questions end with T23 (low rising) which is contingent with boundary tone, T23 under boundary tone accelerates its F0 rise to approximate T25 (high rising). In contrast, Mandarin questions preserve lexical tonal shapes in the final sentence position (Chen, 2022) but raise overall pitch rather than imposing a final rise (Liu, 2009).

Despite this clear typological difference, the intonation patterns of L3-Mandarin produced by Cantonese-L1 speakers remain underexplored. This study investigates whether Cantonese speakers transfer their L1 boundary tone strategy into their Mandarin-L3, specifically in utterances ending with the rising tone (T214). The following research questions are addressed:

1. Do Cantonese-L1 speakers transfer the final-syllable timing of the Cantonese boundary tone to their L3 Mandarin questions?

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2. Do Cantonese-L1 speakers' Mandarin proficiency affect the transfer? If yes, what are the patterns?

Methodology

The trilingual speech data were drawn from a forensic phonetic corpus (Cao & Mok, 2023). Participants were 20 young (M = 21.26, SD= 2.32), gender-balanced Cantonese-L1 speakers from Hong Kong. They completed an elicitation task in Cantonese and Mandarin, producing four sentence types: statement, yes-no question, intonation question, and wh-question. As showed in Table 1, all target sentences ended with the syllable "腦" (meaning "brain" in English; corresponding to tone T23 in Cantonese [nou23] and T214 in Mandarin [nau214]), and the bolded characters were used to visualize F0 contours. To access proficiency, 100 native Mandarin listeners rated the standardness of each speaker's Mandarin accent based on a 10-second recording, using a 10-point scale.

Target sentences were annotated in Praat. Using the ProsodyPro script (Xu, 2013), 10 F0 points were extracted per syllable for subsequent calculation of mean F0 and normalized for gender difference. Boundary tone divergence points were identified through visual inspection and validated via ANOVA. A linear mixed-effects model was implemented in R to assess the effects of proficiency and sentence types on final-syllable F0 mean value.

Table 1. The list of sentences for the elicitation task.

Sentence Type	Mandarin	Cantonese
Statement	你們拿了她的電腦。	你哋攞咗我部電腦。
	(English: You take her computer.)	
Yes-no Q	你們是不是也拿了她的電腦？	你哋係唔係都攞咗佢部電腦？
	(English: Did you take her computer as well?)	
Intonation Q	你們也拿了她的電腦？	你哋攞咗佢部電腦？
	(English: You take her computer?)	
Wh- Q	為什麼拿了她的電腦？	點解攞我部電腦？
	(English: Why did you take her computer?)	

Results

The F0 contours of the last three syllables (Figure 1) revealed systematic differences between L1-Cantonese and L3-Mandarin. In Cantonese, yes-no questions diverged from statements at the final syllable, while intonation

questions overlapped with statements until the final syllable's midpoint before sharply rising to mimic T25. In L3-Mandarin, however, intonation questions diverged earlier at the penultimate syllable, whereas yes-no and wh-questions retained final-syllable divergence. Crucially, all L3-Mandarin sentence types preserved T214's fall-rise shape.

Descriptively, the pitch of the final syllable was higher in questions than statements for both languages (see in Figure 1), though this difference was not statistically significant in ANOVA. Notably, in L3-Mandarin, the F0 contours for questions were generally higher than for statements, whereas in Cantonese they showed more overlap. This pattern in L3-Mandarin aligns with the native Mandarin strategy of using overall higher pitch to mark questions (Liu, 2009). To investigate this, a linear fixed model was fitted to examine the effect of Mandarin proficiency and sentence types on F0 mean value of the last syllable in Mandarin-L3. Participants demonstrated a fair level of Mandarin proficiency (M = 5.86, SD = 0.91). The analysis revealed a significant positive effect of Mandarin proficiency for F0 values (β = 11.41 Hz, t = 6.09, p<0.001), and a mild negative effect of statement (β = -9.51 Hz, t = -1.97, p=0.05).

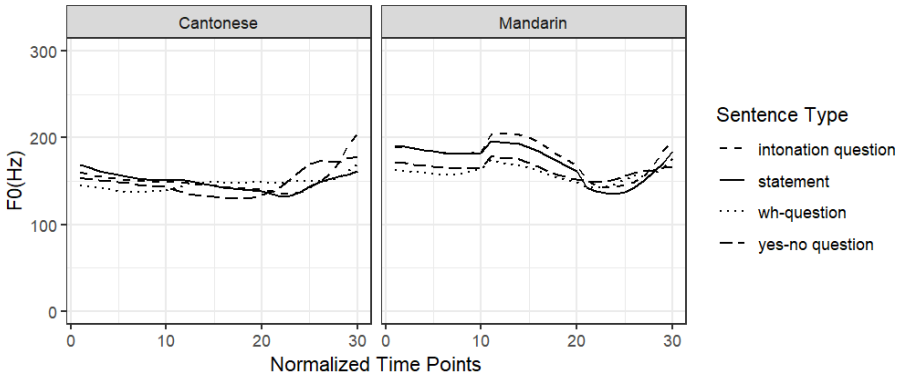

Figure 1. The last three syllables' F0 contours of four sentence types in Cantonese and L3-Mandarin

This study demonstrates asymmetric prosodic transfer in Cantonese-L1 speakers' L3-Mandarin. The timing of the L1 boundary tone partially persists, as seen in the final-syllable divergence of yes/no questions in L3-Mandarin. However, trilingual speakers successfully maintained the target Mandarin T214 hall-rise contour across all sentences, contrasting with Mandarin-L1 speakers' use of falling contours in statements and falling-rising in the yes-no, confirmation and particle questions (Liu, 2009).

Furthermore, higher Mandarin proficiency significantly predicted increased final-syllable F0 in questions, suggesting that the more advanced participants were, the higher pitch they used in the final syllable of all questions. It is

consistent with the strategy adopted by native Mandarin speakers (Liu, 2009). This duality reflects a tension in L3 prosody acquisition: the Cantonese-dominant prosodic strategy of boundary tone timing competes with the Mandarin requirement for lexical tonal preservation. The findings highlight how tonal typology constrains bilingual intonation.

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